



Field Portable Gas Fueled UN 6(c) Test Assembly

Research and Development Forum
January 17, 2014
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Why Develop a Gas Fueled UN 6c Test Assembly?

- Sustain constant temperature
- Less post-test clean up vice using wood-fuel
- Ability to shut off fuel when reactions are complete
- Ability to run multiple tests quickly (less cool down time)
- Fuel savings results in lower test costs
- More environmentally friendly





The Test Assembly

- Need to meet the UN description of a gas fed fire (see UN Manual of Tests and Criteria - 16.6.1.3.4)
- The proposed gas fuel burner assembly is approximately 2.5 square meters (m^2) when complete and fabricated of carbon steel with inlets for gas at either end.
- Find the minimum number of liquefied gas cylinders necessary to achieve constant burner flame temperatures for at least 30 minutes without external heat input or evaporation devices to maintain constant flow of gas.
 - Experimentally determined to be twelve (12) cylinders, if all were surrounded with a sufficiently sized ambient temperature water bath.





The Test Assembly





The Analysis

- A 32-minute field trial was conducted and record in video
 - Panasonic AG HVX 200A P2 camera
 - 60 frames/second
 - Vision Research Phantom Flex v1610 high speed camera
 - 600 frames/second at 20 second intervals.
- Constant flame temperature of approximately 800°C for the 32 minutes
 - Consumed approx. 8.3-8.4 kg/min (16.9-17.1 l/min) over all 12 cylinders
 - or approx. 0.7 kg/min (1.4 l/min) per cylinder.





Photograph of Propane Burning





Propane Burner Demonstration Test

- Intended to show feasibility and other possible benefits (i.e. lower thermal flux from fuel)
- Two packages of a fast-burning double-base propellant (Green Dot®)
 - each containing two inner packagings having 3.6 kg (8 lbs) of powder inside fiberboard drums
 - One outer packaging - single wall UN 4G fiberboard box
 - One outer packaging - double wall UN 4G fiberboard box
- The two packages were placed on the test stand and thermal flux gauges were positioned at 5, 10, and 15 m away from two adjacent sides of the fire
- Thermal flux did not exceed a 4 kw/m² at 15 m during this demonstration





Summary

Gas fuel fires:

- Cleaner burning fuel than either wood or liquid and, consequently, decreased environmental impacts
- A much clearer viewing of explosives during classification tests (less smoke than wood or liquid fuel)
- More stable thermal flux outputs (instrumentation use may be beneficial)
- Since the fire can be extinguished easily after all explosives have completely reacted, cost savings in set-up time and fuel use that may quickly offset initial expenditures (i.e., return-on-investment or ROI) for material and labor costs

